

Interactive comment on “Streamflow trends in Europe: evidence from a dataset of near-natural catchments” by K. Stahl et al.

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We thank Alberto Viglione for his clear and constructive review. The two major issues raised (i) gaps in data coverage and (ii) the question of significance testing indeed presented two major issues during the course of our study.

(i) Data coverage or the lack of it has diverse reasons. One country requested an enormous amount of money for data, another doesn't keep a national database, which would have required gathering data from several tens of river basin authorities, yet another does not have long time series. Some countries were not contacted since as part of this community-driven approach to data collection, we were unable to find within our networks a colleague from each European country who was able and willing

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to participate in this study including data collection or update. We agree that from a practical point of view it may be interesting to the hydrological community to know the details of data availability in each European country. However, we feel that accusing a specific country of not providing or not gathering data is counter-productive. Instead it seems important to show often and clearly the benefit of free data provision and the progress that could be achieved (for more details on data, see Hannah et al., 2010). In short, we hope that perhaps white spots on colorful maps will provide our scientist colleagues across Europe with the necessary arguments to convince their authorities to provide data next time round. We will elaborate a bit more on the issue, but will not put specific countries on the spot.

(ii) The difficulties of testing statistical significance of a trend in environmental variables as discussed on page 5779 in the manuscript have made the application of statistical testing highly controversial. In addition to the question whether a valid null hypothesis can be formulated (see comment by referee H. Lins), we carefully considered whether the objective of the study required significance testing. In our opinion, our objectives do not require, in fact they do not allow statistical testing (p. 5780) as any threshold to the 'surface' of trend will hide the overall patterns revealed and described. The issue was discussed in detail among the co-authors. A UNESCO report on the analyses of trends in drought and low flow which preceded the analyses for this paper included local significances of the modified Mann-Kendall Test which accounts for serial correlation and field significance (Stahl et al., 2008). However the approach of discretization of the results into significant/non-significant and the subjective choice of regions for field significance testing severely restrict a pan-European view on the co-variability, which was the main aim in this paper. Several recently published studies on trends have decided for this solution for the benefit of highlighting co-variability, comparison among variables and process discussion. We think our approach reflects the long debates on this issue by concentrating on these aspects rather than getting lost in issues of statistical testing. We do acknowledge the lack of comment on the no trend records. The percentage can be added to table 2 (though it will be the difference of %pos and

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%neg from 100% and could in principle be calculated by the reader) and we will add comments to the description of the individual results.

Minor comments

We agree that average catchment area may be useful to be included in the data table and suggest to add the average catchment area per country for the records of one period (likely 1962-2004). While elevation and slope may be estimated from the CCM2 that was used for basin boundary delineation, they were not supplied by the countries with the data and hence are not a part of the data set itself. For this reason and because a map of European topography may provide enough guidance on general elevation differences, we suggest not include that data but possibly include some comments on the issue.

The work is primarily a contribution to the FRIEND programme. While FRIEND does not grant money for research, UNESCO funded some of the data collection work and a meeting of the co-authors. The analyses were then expanded within the WATCH project and thus is partly an outcome of WATCH and used within other efforts of WATCH. We suggest to add on page 5776 line 7 that the update was carried out as part of the WATCH project. We will also revise the acknowledgements to clarify.

Trends in southern France for the period 1942-2004 are positive, for 1932-2004 they are mixed (pos in the Pyrenees, negative in south-central France), for the two shorter period they are all negative. Whether this is a regional, perhaps Mediterranean signal, is difficult to say, as long records were not available in Spain. However, for the shorter records trends in southern France are similar to those in Spain. In general, trends depend on the start and end of the period. Mediterranean climate in particular is highly variable with long (multi-year) dry and wet spells. Shifting trends or long-term variability in the region is definitely an interesting aspect to explore, and some additional consideration will be given to this in the text. This is in fact part of ongoing work by some of the authors, in examining sensitivity to trends in the longer hydrometric records used

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in this study (see reply to referee comment by H. Lins).

References: see main manuscript

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